

IMPREGNATION OF CLOTHING WITH INSECT REPELLENT (DIMETHYL PHTHALATE)

War Department, Washington 25, D. C. . . . December 1944

This bulletin follows TB MED 120, subject, "Medical and Sanitary Data on Sumatra." Distribution given TB MED 120 was as follows: AAF (5); ASF (5); AGR (5); AAF Comd (3); Def Comd (3); AA Comd (3); Amph Trng Comd US Pacific Fleet (3); Engr Amph Comd (3); Repl & Sch Comd (3); A/B Ctr (3); Armd Ctr (3); Tech Sv Tng Dv (1); Sv C, Attn: Sv C, Surgeon (3); Sv C, Attn: Tng Div (1); Area A Sv C (3); AAF Sta in Continental US (1); PE (CG) (1); PE (The Surgeon) (1); PE (Intelligence Officer) (1); GH (1); SH (1); RH (1); (Continental US); Med Sv Sch for Officers (1); Med Tech Sch (1); ASF Unit Tng Ctrs (3); Med Dept Repl Tng Ctr (1); Med Lab (Army) (1); Gen Med Lab (1); Med Lab (Dept) (1); Med Lab (Sv C) (1); A (3); CHQ (3); D (3); AF (3).

	Paragraph
Introduction.....	1
Treatment of uniforms.....	2
Precautions.....	3
Protection afforded by impregnation of clothing.....	4
Discipline in use of repellents.....	5

1. INTRODUCTION. *a.* The purpose of this bulletin is to outline a simple method for the rapid and uniform impregnation of clothing in the field with an emulsion of the insect repellent, dimethyl phthalate, employing readily available materials and equipment. The protection afforded by repellent-impregnated clothing is explained.

b. The use of insect repellent is an essential part of the Army's program to protect troops from the bites of disease-carrying insects. In December 1942, dimethyl phthalate was adopted for use when applied to the skin, to protect against mosquitoes and also other insect vectors of diseases, such as mites (chiggers), sandflies, fleas, and ticks. Applied to the skin it usually remains effective for several hours, depending upon sweating conditions. When applied liberally to clothing, its effectiveness in preventing bites through the fabric is prolonged from several days to a week or more.

c. The most important use of dimethyl phthalate applied to clothing is to repel and kill larval mites which transmit scrub typhus. The prevention of scrub typhus is a problem of increas-

ing importance in the Southwest Pacific and Southeast Asia. The wearing of repellent-impregnated clothing provides one of the most practicable and efficient methods of individual protection in the field against the disease. For new landings in general endemic areas of the disease, the wearing of dimethyl phthalate-impregnated clothing is imperative.

d. Dimethyl phthalate for clothing impregnation is supplied in 1-gallon containers, and is listed as QM Item No. 51-R-300, "Repellent, insect, spray, clothing (dimethyl phthalate)." An allowance of 40 gallons per 1,000 men per month is authorized by War Department Circular No. 151, 1944, in the Southwest Pacific, South Pacific, Central Pacific (except Hawaiian Department) and the China - Burma - India theaters.

2. TREATMENT OF UNIFORMS. *a. Materials.* The materials required to prepare sufficient emulsion to impregnate approximately 100 uniforms include: 7½ quarts dimethyl phthalate, 6 pounds GI laundry soap (about 7 cakes), 35 gallons of water, one 55-gallon oil drum, one 32-gallon GI can or similar container,

a water bucket, and a GI egg-whip (wire) or suitable improvised device for mixing.

b. To prepare emulsion. (1) Cut 6 pounds of GI laundry soap (7 cakes) into small pieces and dissolve in 10 gallons of water by boiling in an oil drum. Then add 25 gallons of cool water. Do not boil the entire 35 gallons.

(2) Pour 3 gallons of this soap solution into a GI can, and to it slowly add 7½ quarts of dimethyl phthalate, whipping vigorously to make a creamy concentrate. Return this concentrate to the drum of soap solution and stir to make the finished emulsion. The final product represents a 5-percent emulsion of dimethyl phthalate in a 2-percent soap solution, measuring about 37 gallons.

c. Impregnation of clothing. (1) Only dry materials should be treated and the emulsion should be stirred while garments are being dipped.

(2) Completely immerse clothing, shirt and trousers or coveralls, socks (placed in trouser pockets) and/or leggings, in the emulsion. Wring out over a second container to save excess liquid. Hang up to dry. The clothing is ready to be worn when dry. To facilitate inspection of personnel, a system of marking clothing to indicate impregnation and date of treatment of the clothing should be employed.

(3) Blankets and mosquito bars may also be treated in the above manner.

(4) For protection against mites, impregnation of clothing should be repeated after each laundering. For blankets, treatment at 2-month intervals is sufficient.

(5) Thorough impregnation withstands sun, rain, and excessive sweating. Vigorous scrubbing with soap and cold water or laundering with hot water removes the dimethyl phthalate.

d. Impregnation of clothing by spraying. When the preparation of the above emulsion is not practicable, dimethyl phthalate, undiluted, may be applied to clothing with a "flit-gun," knapsack sprayer or paint-spray gun, delivering a large droplet spray. Clothing may be treated off the body by spraying into the garments that have been turned inside out and buttoned. To apply, insert the sprayer inside the reversed garment and hold the sleeves, neck of shirt and bottoms of trousers closed while the spray is delivered. The clothing may be sprayed while being worn, provided care is taken to protect

the eyes and mouth and not to breathe the spray material. Two to 3 ounces of dimethyl phthalate is sufficient to treat one uniform. It is necessary to repeat the application after each laundering.

3. PRECAUTIONS. *a. Untreated Shorts* should be worn under treated uniforms to prevent skin irritation in the groins. No other precautions are necessary. No ill effects have been reported from wearing treated clothing.

b. It should be emphasized that clothing impregnated with dimethyl phthalate does not protect exposed body surfaces from insect bites. For protection of these areas, application of repellent to the skin must supplement the use of impregnated clothing. The standard 2-ounce bottle of insect repellent (QM Item 51-R-265) should be employed for this purpose.

4. PROTECTION AFFORDED BY IMPREGNATION OF CLOTHING. *a.* Garments treated with the emulsion as directed above will remain miteproof during 5 weeks of occasional wearing, or, will protect the wearer until laundering is necessary when worn daily under ordinary field conditions. Freshly treated clothing is both repellent and toxic to larval mites, but the repellency is apparently of short duration. The effectiveness and duration of action of the dimethyl phthalate against mites depends principally on its toxic effect as a contact poison. The impregnation of clothing with repellent is primarily for protection against mite-borne typhus (scrub typhus). Under field conditions, with unavoidable prolonged exposure of personnel and the uncertainty of reliance on individual application of repellent, the wearing of antimite impregnated clothing is the best temporary measure of protection against the disease and has contributed to the reduction in the incidence of the disease. This should by no means discourage the employment of additional protective or control measures.

b. In addition to providing protection against mites, clothing impregnated with dimethyl phthalate also affords limited protection against the bites of mosquitoes, sandflies, fleas, and ticks. Originally adopted as a mosquito repellent for application to the skin, the effectiveness of dimethyl phthalate against these insects is prolonged when applied to cloth. It is of particular value in preventing mosquito bites through gar-

ments where the clothing fits tightly over the skin. Impregnated clothing affords protection from mosquito bites through fabric for a period of at least a few days, although mite protection may last for several weeks. When applied to the skin, dimethyl phthalate is highly effective against *Phlebotomus*, the vector of leishmaniasis, Oroya fever, and sandfly fever. Although sandflies do not ordinarily bite through clothes, they may crawl between blankets and up sleeves and trouser legs. The impregnation of clothing affords an additional measure of protection against these flies. For protection from fleas, repellent may be applied to clothing in the manner described for mites. While repellent-impregnated clothing does not prevent fleas from lighting, the fleas leave the treated surface almost immediately and do not bite. Repellent-treated clothing has proved an efficient barrier to larval or seed ticks, but is less effective against the nymph and adult stages. Under field conditions, freshly treated clothing reduces tick attachment from 50 to 90 percent.

5. DISCIPLINE IN USE OF REPELLENTS. *a.* Individual disease control measures, such as the application of repellent or the use

[AG 300.5 (22 Nov 44)]

BY ORDER OF THE SECRETARY OF WAR:

OFFICIAL:

J. A. ULIO
Major General
The Adjutant General

G. C. MARSHALL
Chief of Staff

DISTRIBUTION:

AAF (10); AGF (10); ASF (10); T of Opns (The Surg) (3); AAF Cs (3); Def C (The Surg) (3); SvC (The Surg) (3); GH (3); M Conc C (3); Malaria Survey Units (3); Malaria Control Units (3); A (The Surg) (3); CHQ (The Surg) (3); D (The Surg) (3).
For explanation of symbols, see FM 21-6.

of impregnated clothing, require vigorous command support to be effective. During a major epidemic of scrub typhus on one Pacific island, marking of treated uniforms and the date, applicable to all ranks in the command, was ordered to insure adequate protection and checking of exposed work details.

b. An example of the need for repellent discipline is illustrated by the comparison of three patrols which operated successively in the same area. Fifty-three cases of scrub typhus occurred in the first group which was not protected by repellent-impregnated clothing. In contrast, dimethyl phthalate was liberally applied to the clothing and gear of a second patrol, of equal strength to the first, and no member developed the disease; only two individuals acquired a single mite bite. Later, another patrol which neglected to use treated clothing, entered the area, with the result that 23 cases of scrub typhus occurred in the group.

c. The effectiveness of dimethyl phthalate-impregnated clothing in preventing scrub typhus emphasizes the need for rigorous employment of this protective measure among troops exposed in endemic areas.